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Decentralization and Public Services

The Case of Immunization

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Abstract

Khaleghian studies the impact of political decentralization on childhood immunization, an essential public service provided in almost all countries. He examines the relationship empirically using a time-series data set of 140 low- and middle-income countries from 1980 to 1997. The author finds that decentralization has different effects in low- and middle-income countries. In the low-income group, decentralized countries have higher coverage rates than centralized ones, with an average difference of 8.5 percent for measles and DTP3 vaccines. In the middle-income group, the reverse effect is observed: decentralized countries have *lower* coverage rates than centralized ones, with an average difference of 5.2 percent for the same vaccines. Both results are significant at the 99 percent level. Modifiers of the decentralization-immunization relationship also differ in the two groups. In the low-income group, development assistance reduces the gains from decentralization. In the middle-income group, democratic government mitigates the negative effects of decentralization, and decentralization reverses the negative effects of ethnic tension and ethno-linguistic fractionalization, but institutional quality and literacy rates have no interactive effect either way. Similar results are obtained whether decentralization is measured with a dichotomous categorical variable or with more specific measures of fiscal decentralization. The study confirms predictions in the theoretical literature about the negative impact of local political control on services that have public goods characteristics and inter-jurisdictional externalities. The author discusses reasons for the difference between low- and middle-income countries.

This paper—a product of Public Services, Development Research Group—is part of a larger effort in the group to study the delivery of essential health services. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Hedy Sladovich, room MC3-607, telephone 202-473-7698, fax 202-522-1154, email address hsladovich@worldbank.org. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The author may be contacted at pkhaleghian@worldbank.org. March 2003. (43 pages)

Decentralization and Public Services: The Case of Immunization

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1. Introduction

Decentralization has become an increasingly familiar theme in development theory and practice over the past two decades. Yet the literature on decentralization has tended to concentrate on case studies and theoretical discussions rather than empirical analysis, and few studies have explored the practical consequences of decentralization policies in a quantitative way. The purpose of the present study is to empirically test the impact of decentralization on an essential public service provided in all countries—childhood immunization—and to see if the various benefits proposed for decentralization are, in practice, seen. Given the continued interest in decentralization in developing countries, the findings are expected to be of interest to those in the development community as well as to health specialists concerned specifically with immunization.

Examining the impact of decentralization on immunization services has several objectives. First, examining the decentralization-immunization relationship can help health planners and policymakers to predict the likely consequences of decentralizing processes—most of which originate as political decisions outside the health sector—on immunization and similar services (such as family planning or maternal and child health) *within* the health sector. Decentralization has featured prominently in health sector reform efforts in many countries, and there has been considerable discussion of its potential to negatively affect health services such as immunization and family planning (Kolehmainen-Aitken and Newbrander 1997; Melgaard 1998; Feilden and Neilson 2001; POLICY Project 2001). For example, a WHO conference on health reform and immunization in 1999 devoted the majority of its report to the consequences of decentralization (WHO 1999). Published case studies of national immunization and family planning programs have also given prominence to the effect of decentralization on these services (Msambichaka 1998; Fielden and others 1999; POLICY Project 2001). As a rule, these studies have used case studies, qualitative methods and managerial indicators to examine the impact of decentralization. The aim of the present study is to complement these works by using a quantitative approach to measure the approximate *extent* to which decentralization affects the delivery of immunization services, as well as to explore some of the channels through which it works.

Second, if immunization is accepted as a proxy for other (similar) public services, the analysis can illuminate the broader effects of decentralization on public service provision as a whole. Immunization has a number of unique characteristics, so its use as a proxy for all public services is not without shortcomings. But given the ready availability of data on immunization coverage, and the reasonable quality and comparability of these data across time and space, they nevertheless provide a useful lens through which to examine the impact of decentralization policies in a quantitative and comparative way. Caution is required when generalizing such findings, except perhaps to similar services such as malaria control or maternal and child health: but the exercise can nonetheless provide helpful insights into the effects of decentralization and a platform for testing

some of the theoretical benefits proposed for it. This study therefore contributes to a small but emerging literature that uses quantitative analysis to examine the impact of decentralization on public services, examples of which include Bird, Ebel and Wallich (1995), West and Wong (1995), Isham and Kähkönen (1999), Akin, Hutchinson, and Strumpf (2001) and Faguet (2001).

2. Definitions

For the purposes of this paper, decentralization is defined as the presence of taxing, spending or regulatory authority on the part of subnational authorities such as state, provincial, district or municipal governments. Deconcentration of the health sector (also known as "administrative" or "ministerial" decentralization) is not included, since our primary question is about the implications of political decentralization rather than the organizational arrangements within a given sector[1]; neither is democratic participation a necessary precondition, though it tends to accompany decentralization in most cases.[2] The definition draws from Rondinelli, Nellis and Cheema (1984) and is equivalent to what their paper calls "devolution." We use the more general term "decentralization" to simplify comparisons with its opposite, "centralization." The definition also corresponds to the definition used in Beck and colleagues' (2000) Database of Political Institutions, on which the quantitative analysis below is based.

Since many countries have deconcentrated their health systems, excluding this from our definition would seem to miss a point of policy importance: namely, what happens when ministries of health move their operations closer to the field. This issue, while important, is quite distinct from the question of decentralization proper (devolution). Decentralization and deconcentration differ in both their origins and their content. The former is a political reform designed to reduce the extent of central influence and promote local autonomy instead, while the latter is an administrative reform that can actually strengthen central control over peripheral areas. Our interest in this study is in the former reform and its implications, not the latter, though fruitful insights might be gained from a study of that issue also.[3]

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[1] As used in this paper, the term "decentralized health system" therefore refers to health systems operating in a decentralized (devolved) political environment, and *not* to deconcentrated health systems.

[2] Democracy does not invariably accompany decentralization. China, Mauritania, Sudan, the United Arab Emirates, the Former Republic of Yugoslavia and Zimbabwe are all non-democratic countries where subnational polities have taxing, spending or regulatory authority. The correlation coefficient for the democracy and decentralization variables in our data is only 0.47, implying a positive but weak correlation.

[3] Deconcentration has been described as "centralization in disguise," since it extends the geographic and policy reach of the central government with no guarantee that community participation, accountability, innovation, or any of the other proposed benefits of decentralization will materialize. Case studies in the health sector have highlighted these weaknesses (Campos-Outcalt, Kewa, and Thomason 1995; Jeppson and Okuonzi 2000). On the other hand, deconcentration has been proposed as a way of getting the "best of both worlds." Like devolution, it brings government "closer" to the community and facilitates access to local information; but it also preserves the consistency and parsimony of centralized decisionmaking and it maintains the relative ease of centralized policy implementation. In the absence of good cross-national data

Many studies have used data on subnational expenditures as their sole measure of the extent of decentralization (see, for example, Davoodi and Zou 1998; Fisman and Gatti 1999; Robalino, Picazo, and Voetberg 2001). We depart from this tradition for two reasons: first, because data on subnational expenditures, while providing a tangible and useful indicator of the spending dimension of decentralization, do not capture its taxing or regulatory aspects; and second, because these data may provide a misleading account of the actual autonomy of subnational polities, such as when the composition of local expenditures is determined by the central government and is only nominally under local government control (Ebel and Yilmaz 2002). Expenditure data, being continuous in nature, more accurately reflect the fact that decentralization is not an "all-or-nothing" phenomenon, and that countries exist along a continuum of reform (Hurley, Birch and Eyles 1995; Mills 1994; Smith 1997). This aspect is not captured by the dichotomous definition used here: but the greater comprehensiveness and theoretical consistency of the present definition provide some compensation. Our empirical analysis uses both variables for comparison.

3. Decentralization and public services

Many of the proposed benefits of decentralization are based on the premise that it brings local decisionmakers closer to the constituencies they serve. Implicit in this are assumptions about the nature of information available to local decisionmakers, the presence of effective channels for the public to express wants and preferences, and the incentive environment motivating decisionmakers to respond. Each of these assumptions leads to specific conclusions regarding the benefits of decentralization; and taken together, the resulting argument is compelling: local decisionmakers have access to better information on local circumstances than central authorities, and they use this to tailor services and spending patterns to local needs and preferences; the public provides input to local decisionmaking processes and holds local decisionmakers accountable for their actions; and administrative autonomy creates space for learning, innovation, community participation and the adaptation of public services to local circumstances. Classical descriptions of the benefits of decentralization typically follow one or more of these strands (see, for example, Tiebout 1956 and Musgrave 1959).[4]

Most of these assumptions are open to question, however, especially in developing countries. Local authorities, while advantaged by access to information on local circumstances, may be disadvantaged by a lack of access to technical information or to the expert individuals required to interpret it. Channels for the public to express their wants and preferences may be ineffective—and the institutional capacity and incentives for local decisionmakers to respond may be weak anyway—so accountability and participation may remain unchanged. And local administrative autonomy, while providing scope for innovation, learning and local adaptation, might just as easily lead to

on health system deconcentration, we were not able to examine these differences empirically in the present study.

[4] Azfar and colleagues (1999) provide an excellent summary of this literature.

interest group capture of the decisionmaking process, inadequate attention to equity, inter-jurisdictional free riding, and neglect of public goods. These outcomes, where they occur, can be explained by a variety of theoretical concerns, design-related issues, and social, cultural and political factors.

Bardhan and Mookherjee (1998), using a theoretical model of public service provision under decentralized and centralized governments, find that decentralization performs poorly when local authorities are prone to elite capture (*inter alia* a function of elite group preferences for the good or service in question), when inter-jurisdictional externalities are significant, and when local authorities lack access to necessary information. Besley and Coate (1999), also using a theoretical model, find that decentralization performs better in the presence of inter-jurisdictional heterogeneities (of language or culture, for example) and worse for goods or services with inter-jurisdictional spillovers (externalities). Paul (1991) discusses constraints to the use of voice and exit mechanisms—both being theoretical determinants of the accountability and efficiency benefits of decentralized systems—and points to legal and institutional barriers, informational asymmetries, income and education-related factors as constraints to the use of voice, and legal barriers, spatial barriers, monopolistic provision and public good characteristics as constraints to the use of exit.[5] Using detailed studies of decentralization and public service delivery in Uganda and the Philippines, Azfar, Kähkönen and Meagher (2001) highlight several reasons why the expected benefits of decentralization have failed to materialize in those countries: namely, that local governments have limited authority and are unable to adjust services, even when they perceive local demands; that citizen influence at the local level is hampered by limited information on the responsibilities and performance of local governments[6]; that exit mechanisms have a limited effect on public service delivery and therefore fail to provide a disciplinary incentive for local authorities; that local government capacities are generally weak; and that public goods with inter-jurisdictional externalities are particularly vulnerable to deterioration in decentralized settings.[7] Litvack, Ahmad, and Bird (1998) also concentrate on the institutional determinants of successful decentralization, pointing out that much of the literature on decentralization assumes the

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[5] In this context, "voice" refers to mechanisms of participation of protest that induce service providers to improve their performance. "Exit" refers to the practical ability of service users to use an alternative provider (Hirschman 1970).

[6] Hence the importance of the media, which they also found to be significant.

[7] The reasons for this are very similar to those for market failure more generally. An independent local jurisdiction, much like an independent individual, will be reluctant to invest fully in a product or service whose benefits are shared with its neighbors. In the absence of an external stimulus, an independent local authority—like many independent individuals—will only be prepared to meet the cost of a product or service to the extent that it receives a direct benefit in return. Even worse, the local authority may choose to "free ride" on the investments of surrounding jurisdictions rather than invest anything in the program at all, in much the same way as parents who refuse immunization for their children on the grounds that other children's immunization status will protect their child as well. This is why services such as immunization—which has benefit externalities that "spill over" from one jurisdiction to its neighbors—are prone to deterioration when handed over to independent local jurisdictions for implementation.

existence of institutions that are very weak in developing countries. They illustrate this with reference to voice and exit options and how in developing countries, weak institutions can undermine the effectiveness of both: "Democratic systems are often frail, rendering the electoral system a highly problematic method of achieving accountability. Strong local participation can overcome weak formal election systems, but powerful elites make this difficult in many places. Mobility is often constrained due to poor information, infrastructure and legal frameworks, which result in weak markets for land, labor and capital. Although there is at least some degree of urbanization in all countries, particularly in smaller municipalities and throughout rural areas, it is often unrealistic for a family to sell their land, learn of employment opportunities in other jurisdictions, physically move to the new area, and borrow money in a new locality where they are unknown. The chances of overcoming these obstacles are further reduced since households are likely to be risk averse in developing countries due to low incomes and weak social safety nets." Prud'homme (1995) highlights other shortcomings associated with decentralization, including its effects on equity and efficiency.[8]

Also relevant is the design of central-local relations and the division of responsibilities between central, intermediate and local bodies. According to public finance theory, decisionmaking should occur at the lowest level of government that can fully internalize its benefits and costs (Huther and Shah 1994). Two implications ensue: first, that goods and services can be differentiated according to the most appropriate level for their delivery, implying in turn that some should be decentralized and others shouldn't (Rondinelli, McCullough, and Johnson 1989; Girishankar 1998); and second, that local

[8] Proponents of decentralization claim a number of benefits for the efficiency and equity of government performance. On the efficiency side, it is claimed that the proximity of local authorities to the communities they govern improves the quality of governance through factors such as strengthened accountability, reduced corruption and improved information on local circumstances and preferences (Hurley, Birch, and Eyles 1995; Mookherjee 2001). On the equity side, it is claimed that decentralizing the responsibility for targeting poor households improves the effectiveness of such efforts, again because of informational issues related to the proximity of local authorities to the communities they administer (Litvack, Ahmed, and Bird 1998). Prud'homme (1995) takes a more critical perspective and highlights a number of potentially negative impacts. He points out that equity can suffer if decentralized local authorities are "captured" by local elites, and that the motivation for pro-poor targeting may be less strong at the local level anyway. He also points out that decentralization can undermine both allocative and technical efficiency. On allocative efficiency, he highlights the de-linkage between electoral behavior—the usual way through which local preferences are voiced, at least in democratic systems—and actual social preferences at the local level. He also criticizes the assumption that local politicians and bureaucrats will inevitably respond to these preferences, citing a number of informational and principal-agent problems at the local level. On technical efficiency, he points to losses in economies of scale and reduced investment in public goods such as public information, research and development and efforts to promote technology diffusion. Prud'homme admits the speculative nature of many of his comments. Subsequent research has confirmed some of his concerns and clarified others. Khemani (2001) finds that voters in India are not as myopic as theorists have often supposed, and that local voting patterns are strongly correlated with local government performance in economically productive investments such as infrastructure and with changes in income distribution over time. Ravallion (1998), in a study of income redistribution policies in Argentina, finds that the effectiveness of local governments in targeting the poor varies substantially from province to province, and that strong central oversight is necessary to ensure effective targeting of the poor by decentralized local authorities.

authorities should be provided with a level of revenue-raising, spending and regulatory authority that matches the responsibilities they shoulder. Decentralized systems in developing countries frequently fail on both counts. Local governments are given responsibilities for which they are ill-prepared or too small to carry out, or functions that should remain centralized (or at least under central supervision); and central governments, reluctant to cede too much power, limit the autonomy of local authorities or preserve control over functions that might be better administered locally (Bossert 2000).[9] At one extreme, public goods are neglected, inter-jurisdictional inequities are exacerbated, economies of scale are lost, and essential stabilizing functions deteriorate (Litvack, Ahmed, and Bird 1998); at the other, local authorities are provided with so little autonomy that none of the anticipated benefits of decentralization materialize. The absence of other institutional requirements for effective intergovernmental relations—an adequate constitutional and legal framework, respect for the rule of law, and experience with contract management, for example—may produce similar outcomes, even if the balance of responsibilities is otherwise well-designed (Azfar and others 1999).

A third issue is the impact of social, cultural and political factors. Social and cultural factors can influence the degree of "decision space" provided to local governments,[10] the nature and content of interactions between central and local authorities, the space for local voice in political life, acceptable standards of practice and accountability, and the style of relationships between public officials and community representatives (Bossert 1998; Atkinson and others 2000). Social capital can also improve the functioning of decentralized systems, as first pointed out by Putnam (1993) and confirmed by others since (Bossert 1998; Azfar and others 1999). Change-averse bureaucracies can hinder the implementation of decentralizing reforms, especially when it involves a perceived loss of authority or the need to accommodate new political masters. And political factors—centralized political traditions, interest group politics, and

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[9] Bossert (2000, p.6) illustrates this with reference to decentralization experiences in Chile, Colombia and Bolivia: "It is important to note that there are strong political forces that may produce a tendency over time to narrow choice over key functions. In Chile, the initial wide choice over human resources was later restricted by the Statute of Primary Health Care Workers. In Colombia, the initial choice allowed by Law 60 was restricted by Law 100, which assigned a percent of local funding to insurance plans. In Bolivia, the introduction of the Seguro Materno Infantil [a financing mechanism for maternal and child health services], earmarked a percentage of local funding for specific expenditures and reduced choice over fee collection. These shifts focused on the major areas of control—allocation of expenditure and human resources. In the case of restrictions on human resources in Chile, they were the result of political pressure by the health professionals. In the cases of restricting choice on expenditures, the initiatives were from the Ministries of Health attempting to force local governments to allocate funding to national priorities."

[10] Bossert (1998) uses the term "decision space" to define the range of effective choice allowed by central authorities over local authorities. He distinguishes between formal and informal rules in setting the boundaries of this space, and he incorporates the concept into a modified principal-agent framework for the analysis of decentralization in the health sector. Case studies in Uganda, Zambia, Ghana and the Philippines (Bossert, Beauvais and Bowser 2000) and Chile, Colombia and Bolivia (Bossert 2000) illustrate the use of this approach.

political pressures to retain the *status quo*—can influence decentralization at all stages, from design and implementation to the policy directions taken by local authorities.[11]

For all their apparent pessimism, none of the arguments in this section constitutes an outright rejection of the value or potential of decentralization. They do, however, highlight the extensive range of institutional preconditions necessary for it to be successful, and they point out areas where special caution is required. Proper institutional design can avoid many of the pitfalls described: but given the political and often unplanned nature of decentralizing reforms, the luxury of careful design and phased implementation are seldom encountered in practice. Instead, decentralization more usually resembles a haphazard and hastily implemented reform, often introduced as "a reluctant and disorderly series of concessions by central governments attempting to maintain political stability" (Dillinger 1994). The main issue of practical interest is therefore not *whether* to decentralize, since this is usually a political decision outside the influence of technical specialists and policy advisors, but rather *what* to decentralize and *how* to decentralize it. Both qualitative and quantitative studies can inform these questions. In the next section, we briefly examine the experience of decentralization in the health sector, illustrating points made in this section with examples from the literature. The remainder of the paper concentrates on immunization and the results of our empirical analysis.

4. Decentralization and the health sector

Experience in the health sector has confirmed many of the problems summarized above. Community participation has seldom materialized as expected, capacity constraints have prevented decentralized managers from carrying out their new functions or adopting innovative approaches, accountability has failed to emerge, and failures of institutional design have left both central and local authorities confused about their responsibilities and relationships. Case studies have illustrated these issues in a number of countries. In Papua New Guinea, key issues included severely limited management capacity at provincial and sub-district levels, a lack of participation by citizens and communities in decisionmaking and oversight processes, inadequate oversight of health services by elected local officials, administrative confusion and inflamed relationships between central and local authorities, and fragmentation of workforce development that

[11] Smith (1997) points out that, "Without doubt, the most serious mistake any reformer can make is to assume decentralization to be a managerial exercise devoid of political cause and consequence." Collins (1989) and Collins and Green (1994) extend this point to paint an especially bleak (if rather extreme) picture of decentralization as a "wolf in sheep's clothing," describing it as a technical excuse for covert political objectives such as reducing the role of the state, dispersing social and political conflict, strengthening the position of elite and dominant groups and expanding central government control over the periphery. Manor (1999) provides a comprehensive review of the political economy of (democratic) decentralization, illustrating his discussion with examples from several sectors and a wide range of developing countries. Accounts specific to the health sector include Aráujo (1997), Atkinson and others. (2000) and Collins, Araujo and Barbosa (2000), all on Brazil, and Gilson, Kilima and Tanner (1994) on Tanzania.

resulted in staff shortages and inequities in the distribution of human resources (Campos-Outcalt and Newbrander 1989; Thomason, Newbrander, and Kolehmainen-Aitken 1991; Kolehmainen-Aitken 1992; Campos-Outcalt, Kewa, and Thomason 1995).[12] In Brazil, tensions between the government's devolutionary intentions, the country's strong centralist political tradition, and the resistance of civil servants and other bureaucratic actors resulted in a "hybrid" of devolution and deconcentration in which central and peripheral responsibilities overlapped, equity was compromised and the fragility of local governments prevented them from undertaking effective oversight of the health sector (Araújo 1997; Collins, Araújo, and Barbosa 2000). In Mexico, too, decentralization fell short of its devolutionary intentions and was strongly opposed by bureaucratic actors, becoming "more a measure to increase central control than a democratic principle or a response to political pressure from below"; and centralized political traditions made decentralized planning and intersectoral coordination difficult to achieve, with consequences for the equity and efficiency of health services (González-Block and others 1989). In Chile, local governments were provided with little autonomy over key health sector functions, and inconsistencies in the devolution of responsibility for primary health services led to significant variance in local governments' provision of funds for these services (Bossert, Larrañaga, and Ruiz-Meir 2000). In Bolivia, mechanisms to allow local communities to choose between health and other priorities led to a sharp reduction in health spending after decentralization, and limited managerial capacities at the *central* level led to weaknesses in the monitoring and supervision of local governments (Bossert, Larrañaga, and Ruiz-Meir 2000). In the Philippines, health workers resisted efforts to devolve their employment to local governments, inter-jurisdictional inequities were exacerbated, and local health spending failed to keep pace with the cost of devolved health functions in spite of substantial increases in central-local transfers and local governments' revenue raising powers (Bossert, Beauvais, and Bowser 2000; Lieberman 2002).

In Tanzania, district health managers lacked the authority and skills to address problems they identified at the district level, conflicts arose between demands for central control and local discretion, and accountability structures became confusing, with "multiple and cross-cutting flows of authority within and between levels of the system" (Gilson, Kilima, and Tanner 1994). In Uganda, the potential for involving community groups and local leaders in decisionmaking processes has gone largely unfulfilled, devolved civil servants have experienced a worsening of their salaries, working conditions and promotional opportunities, patronage and tribalism have entered local decisions on recruitment and promotion, and preventive services have suffered through a combination of weak central oversight, incompatibility between donor-funded vertical programs and decentralized primary health services, and the failure of local authorities to prioritize these services when faced with other concerns (Mwesigye 1999; Jeppsson and

[12] Not surprisingly, a survey of health workers found widespread negative perceptions of the process and outcomes of decentralization in Papua New Guinea (Campos-Outcalt, Kewa, and Thomason 1995).

Okuonzi 2000; Bossert, Beauvais, and Bowser 2000). Gilson and Mills (1995) identified similar problems in other countries in sub-Saharan Africa as well.[13]

Not all accounts have been negative, however. Tendler and Freedheim's (1994) account of public health services in the state of Céara, Brazil, indicates the positive outcomes that can follow when decentralized authorities implement far-reaching institutional and management reforms and central authorities provide them with the proper incentives, guidance and support.[14] Bossert, Soebekti, and Rai (1991) illustrate the benefits that can accrue from investments in managerial capacity building, drawing on the example of a donor-funded project in Indonesia. And a collection of studies in Latin America by the POLICY Project (2000) shows how community participation can be institutionalized in decentralized health systems and improve the implementation of programs focused on sexual and reproductive health.

A related point is that many critical accounts have suffered from methodological or interpretive flaws, commonly criticizing decentralization as part of an entire basket of reforms (such as user fees, structural adjustment programs and policies to promote economic liberalization) and failing to distinguish the specific strengths, weaknesses and determinants of each (see, for example, Garfield 1999, and Birn, Zimmerman and Garfield 2000). To some extent the problem is unavoidable: reforms do tend to occur together, and they often have mutually reinforcing characteristics that can make disaggregation difficult (Gilson and Mills 1995); but to condemn or criticize a specific reform without considering these interactions is to "throw out the baby with the bathwater" and provides little information of policy relevance.

5. Decentralization and immunization

The impact of decentralization on immunization is a matter of special concern for three reasons. First, immunization is among the cheapest and most effective health

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[13] An early publication by the World Health Organization (Mills and others 1990) also included brief case studies on Botswana, Chile, Mexico, The Netherlands, New Zealand, Papua New Guinea, Senegal, Spain, Sri Lanka and Yugoslavia. An extensive literature also exists on the performance of district health systems, aspects of which are relevant to decentralization as well. A recent paper prepared for the Commission on Macroeconomics and Health provides a comprehensive summary of this literature (Oliveira-Cruz, Hanson, and Mills 2001).

[14] Tendler and Freedheim point out that "although this case might be seen as a success in decentralization of public service from state to municipal government, the success had more to do with something done by central, rather than local, government" (1994, p.1773). In a section titled "The Central in the Decentralized", they describe several central government actions that played an important role in the success of the Céara case. These included: significant investments in public information regarding public health services, which led communities to hold elected mayors accountable for these services in their area; careful control over selected human resource issues, which reduced patronage at the local level; a slow, phased approach to implementing the program, in which early adopters were nurtured to success and the news of these "success stories" was widely shared, thereby overcoming the reluctance of local politicians in non-adopting areas by generating public demand for them to join the program; and strong central involvement in motivating and inspiring front-line health workers, which gave them a broader identity than their local links, assured them of support by the central level, and thus enabled them to say "no" when pressured by local politicians to divert the program toward local political objectives.

interventions available and is a core element of public health programs in all countries. Properly carried out, immunization programs can have a dramatic impact on childhood morbidity and mortality from communicable diseases, especially in developing countries and especially among the poor (Jamison and others 1993; Koenig, Bishai, and Khan 2000); and they are increasingly recognized as a essential element of national *development* strategies, and not just as public health programs alone. Second, immunization coverage rates—which measure the proportion of children of a certain age that have been vaccinated correctly relative to a country's immunization schedule—provide a convenient and readily available source of data for cross-national comparisons of public service provision, and can be used (with due caution) as a marker of the impact of policies such as decentralization on public service provision more broadly (Bos and Batson 2000). Third, immunization is an exemplar of services on which decentralization may have a negative effect—in theory at least—because of its public good elements, its externalities, and the impact of these characteristics on local government behavior, community participation and accountability.

Theoretical studies of decentralization generally predict a negative impact for services with inter-jurisdictional externalities and public good characteristics (Besley and Coate 1999; Bardhan and Mookerhjee 1998). Immunization has aspects of both. Externalities arise because the benefits of vaccination are shared, accruing not only to the immunized community but also to those around it,[15] while immunization-related public goods include such essential tasks such as disease surveillance and health communication activities, the benefits of which are so widely shared as to be virtually indivisible. Left to themselves, local authorities may take advantage of these shared benefits by "free riding" on the immunization status of their neighbors, either by providing inadequate resources for their own programs or neglecting to carry out essential functions such as monitoring and supervision or disease surveillance. If a majority of jurisdictions adopt this approach, then the functioning of the immunization program nationally—and therefore the level of disease protection in the country as a whole, including for those who *are* immunized—can be compromised as a result.

Preventing this requires a strong role for the center, even in decentralized systems. In practice, however, decentralizing reforms are frequently accompanied by a weakening of key central functions, and the stabilizing and coordinating role of central authorities is compromised. In Nepal, for example, decentralization was associated with significant staff cuts at the central level, with negative implications for the country's Expanded Program on Immunization (World Bank 2000). In Uganda, central support for monitoring and supervision was reduced, and coverage rates fell as a result (Government of Uganda 1998). A detailed case study of decentralization and immunization in Indonesia revealed similar problems in that country, with a significant reduction of central involvement in areas such as vaccine procurement, policy development, monitoring and evaluation, public information, quality assurance, and disease surveillance activities, among others

[15] This is known as "herd immunity." For comprehensive descriptions, see Anderson and May (1990) and Fine (1993).

(Soerojo and Wilson 2001). Fielden and Neilsen (2001) summarize the appropriate division of immunization-related tasks between central and local authorities in decentralized systems, pointing out that tasks such as policy making, donor coordination, vaccine procurement and overall monitoring should remain within the purview of central authorities, while other tasks such as the formulation of service delivery strategies and carrying out front-line disease surveillance can be devolved to sub-national units. Soerojo and Wilson (2001), drawing lessons from Indonesia's experience with decentralization, emphasize the importance of making these distinctions clear to all parties—both central and local—and ensuring that an adequate legal and regulatory framework exists for activities (such as disease surveillance) that require significant central-local coordination.

A second theoretical prediction is that community participation, especially in resource allocation decisions, may have a negative impact on immunization programs. The reasons for this are not difficult to understand. Communities, faced with a multitude of pressing needs and generally unaware of the value of immunization, may consider immunization to be a low priority among the various other goods and services—including curative health services—which their local authorities can provide. In the absence of other incentives (such as strong central pressure or financial controls), local authorities may respond to these preferences by allocating funding *away* from immunization—and may not in any case be held accountable for its provision by the community, whether directly or through electoral mechanisms—and local immunization programs may suffer as a result. Even *with* central pressure and oversight, however, the principal-agent relationship between local and central authorities may lead to the same conclusion, with local authorities neglecting central requirements and responding more strongly to local preferences instead.[16]

Published accounts tend to confirm these expectations. In Uganda, local governments spent less on public and semi-public goods after decentralization than before it, with a consequent under-provision of essential public health services such as immunization (Akin, Hutchinson, and Strumpf 2001). In the Philippines, decentralization shifted the balance of health expenditures away from prevention and toward curative care

[16] Akin, Hutchinson and Strumpf (2001) summarize this argument as follows: "[Theoretical models predict that] decentralization can lead to an increased government provision of private goods at the expense of public goods. This is because local governments ignore the spillover benefit of public goods to neighboring governments or are less subject to demands of international aid agencies who pressure for public goods projects. But perhaps more importantly, it is because when private type goods are allowed to be chosen, local citizens will behave rationally. They will reveal preferences for goods that most benefit them directly. Thus the argument goes that very decentralized provision of goods by governments, in which local citizens push for choices given a budget constraint, will often lead to a revealed preference problem similar to the one that leads to the necessity for public provision to begin with. Small governments will tend to vote to provide the goods for which citizens reveal preferences. They will therefore tend to spend on private goods type curative care clinic visits rather than on public goods type services such as health education and communicable disease control. Small governments may, therefore, behave too much like individuals, with the residents not revealing their preferences for public goods but in fact for private goods provided publicly. The hypotheses from the model, therefore, suggest that, in contrast to the conventional wisdom, decentralization of allocation decisions for services such as health care may in fact reduce societal welfare."

(Solon and others 1999 cited in Soerojo and Wilson 2001). In Nicaragua, local authorities ignored central directives to allocate 46 percent of their health expenditures to primary health care and instead allocated larger shares to secondary care, with immunization coverage in the affected districts falling by up to 50 percent in three years (Birn, Zimmerman, and Garfield 2000). In Indonesia, tight competition from other sectors led local mayors to abandon their commitment that 15 percent of their budgets should go to health (World Bank 2001a, cited in Soerojo and Wilson 2001). Similar phenomena have been noted in Tanzania (Gilson and Mills 1995), Uganda (Jeppson and Okuonzi 2000) and Colombia (Muñoz-Nates 1999 cited in WHO 1999).[17]

Even more troublesome is the possibility that local authorities, under pressure to raise their own revenues and without much in the way of community support for public financing of immunization, might turn to user charges or other forms of cost recovery to finance these services instead. The effect of user charges on the utilization of immunization services has been well document and is generally negative (England and others 2001). China, where some prefectures and counties introduced user fees for preventive services in response to reduced central grants in the early 1990s, and where these services are reported to have suffered as a result, is the usual example (Zheng and Hillier 1995; Ruitai 1999, Zhang and others 1999); but others also exist (Mwesigye 1999; England and others 2001).

A third prediction is that decentralization will not necessarily improve the extent to which local authorities are held accountable for the provision of immunization services. Since most developing countries typically invest little in public information or education on immunization (Kaddar and others 2000), and since there is little evidence that household demand plays a significant role in influencing immunization coverage in information-poor circumstances (Gauri and Khaleghian 2002), it is unlikely that communities will use "voice" mechanisms—even if they exist, which they often don't—to express concern about immunization, especially when faced by other pressing needs. (Indeed a *negative* impact is even possible, as discussed earlier.) "Exit" options are also unlikely to stimulate much accountability. Constraints on geographic exit have been discussed already, but other types of exit—attending private providers rather than public clinics, for example—are also of limited relevance when, as with immunization in developing countries, private providers generally have little interest in the service or are unaffordable to the majority of households, and when few other options exist. Households, especially poor ones, are therefore faced with the public sector as a

[17] Faguet (2001), using the change in sectoral expenditures by local authorities in Bolivia before and after decentralization as an indicator of community preferences and demand, finds that while basic social services were generally given a high priority by local communities, services associated with objective indicators of need—such as education, water management and urban development—were given the highest priority. Allocations to the health sector did not change substantially relative to those in other sectors.

monopoly provider of immunization services, a situation in which exit ceases to be a meaningful way of stimulating accountability (Paul 1991).[18]

A tentative conclusion from this discussion is that immunization, in addition to its well-known propensity for market failure, is also prone to a kind of "government failure" in decentralized systems, and largely for the same reasons: namely, that its public good characteristics and externalities lead local governments to "free ride" on other jurisdictions and make them less willing to meet the full cost of immunizing their local populations; that substantial informational asymmetries are involved, both between the community and local authorities (leading to accountability failures) and between local authorities and the central government (leading to principal-agent problems); and that monopolistic provision—in this case, the fact that non-public providers don't provide much in the way of immunization services—limits the public's opportunities for exit and prevents local authorities from receiving the signals that such options might provide.

On a more positive note, decentralization may enable local authorities to adapt and tailor immunization services to local circumstances. This might be of particular relevance in countries that are ethnically or linguistically diverse, in which local tailoring (of informational materials, for example) might be beneficial. For other countries, however, it could be argued that the negative implications of decentralization will dominate, and that a negative relationship between decentralization and immunization coverage will result. This is the relationship predicted by the theoretical literature, and which we test in the empirical estimations below.

6. Data and variables

To examine these issues, we use a cross-sectional time-series of data on low- and middle-income countries from 1980 to 1997. Data on immunization coverage were obtained from WHO and UNICEF. Data were obtained on coverage rates for two vaccines: measles vaccine, a single vaccine usually administered at around nine months of age, and DPT3 vaccine, the third of a three-vaccine series against diphtheria, pertussis (whooping cough) and tetanus that is usually administered at around 10 to 16 weeks of age. Coverage rates, which measure the proportion of children immunized with each of these vaccines at one year of age, were used as dependent variables.

Data on decentralization were obtained from the Database of Political Institutions (Beck and others 2000). Decentralization was defined as the presence of taxing, spending or regulatory authority on the part of subnational polities such as states, provinces, districts or municipalities, and was coded as a binary variable. The DPI provided this information for a relatively small number of countries (n=65), reflecting its reliance on sources that place little emphasis on this issue. Additional data were therefore collected from a wide range of other sources and incorporated in the data set using the same criteria

[18] Azfar, Kähkönen and Meagher (2001) document this phenomenon with regard to immunization services in Uganda and the Philippines.

as those of the DPI.[19] Data on fiscal decentralization were obtained from the World Bank and were based on primary data in the International Monetary Fund's annual *Government Financial Statistics* (IMF 2001). Two variables for fiscal decentralization were used: one measuring subnational expenditures as a share of total government expenditures (indicating the fiscal freedom of subnational authorities, pursuant to the limitations discussed earlier), and the other measuring health spending as a proportion of all subnational expenditures (indicating the prominence of health within the overall spending pattern of local authorities).

Control variables were obtained for each country-year from the World Bank's *World Development Indicators* data set (2001b). These included GDP per capita in constant 1995 US dollars, population density, population size, and the illiteracy rate, among others. Variables for democracy and regime durability were taken from the Polity IV data set of Marshall and Jaggers (2000). A composite variable for institutional quality was created as an equally weighted combination of five variables—bureaucratic quality, corruption in government, risk of expropriation of property, risk of repudiation of government contracts, and strength of the rule of law—from the political risk section of IRIS-3, a data set based on the International Country Risk Guide (ICRG) rating system that provides annual measures of political, financial and economic risk in 135 countries (Knack and IRIS 2000, PRS Group 2000). A variable for ethnic tension, measured on a six-point scale, was also taken from this data set, and data on ethnolinguistic fractionalization were taken from Taylor and Hudson (1972) and Roeder (2001).[20] Data on donor involvement were obtained directly from PAHO and UNICEF and are the same as those used in Gauri and Khaleghian (2002). Data on income inequality were taken from Deininger and Squire (1996). Countries were grouped in three income categories (low, middle and high) on the basis of the classification reported in the World Bank's annual *World Development Report* (World Bank 2001c).[21] High-income countries were excluded from the analysis.

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[19] Countries with incomplete or missing data for decentralization in the DPI included Albania, Armenia, Bangladesh, Belarus, Benin, Bosnia and Herzegovina, Burkina Faso, Cameroon, China, Côte d'Ivoire, Croatia, DR Congo, Eritrea, Estonia, Gambia, Georgia, Guinea, Guinea, Guinea-Bissau, Guyana., Haiti, Honduras, Indonesia, Kazakhstan, Kenya, Kyrgyz Republic, Laos, Latvia, Lithuania, Madagascar, Malawi, Mali, Mauritania, Moldova, Mongolia, Mongolia, Mozambique, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Philippines, Poland, Romania, Senegal, Slovak Republic, Sri Lanka, Sudan, Tajikistan, Tanzania, Togo, Turkmenistan, Uganda, Ukraine, Uzbekistan, Vietnam, Yemen, Zambia and Zimbabwe. Excluding these countries from the analysis did not change the direction or approximate magnitude of our parameter estimates but did reduce the significance of some variables, as reported in Table 6. The only exception was the decentralization variable itself, which remained significant even when these countries were excluded from the analysis.

[20] The ethnolinguistic fractionalization index measures the probability that two randomly selected persons from the population will not belong to the same ethnolinguistic group For more details, see Taylor and Hudson (1972).

[21] For the years prior to 1987, when income categories were not reported in the WDR, countries were allocated to income categories on the basis of their borrowing status, since the definition of these categories (such as "civil works preference" for low-income countries, and "IBRD eligible" for upper middle-income

7. Methods

Our empirical analysis had two objectives: first, to characterize differences in immunization coverage between decentralized and non-decentralized countries, controlling for other determinants such as national income and contact with donors; and second, to examine how these effects are modified in the presence of factors such as democracy, illiteracy, institutional quality and ethnic heterogeneity. To do this, we modeled immunization coverage rates using the general form

$$Y_{it} = DEC_{it} + \mathbf{X}_{it} + \mathbf{Z}_{it} + e_{it}$$

where Y is the immunization rate in country *i* at time *t*, DEC is a binary variable for decentralization (as described earlier), **X** is a vector of structural indicators, **Z** is a vector of interaction terms, and *e* is a randomly distributed error term. Models of this form usually face two problems when analyzed with ordinary least-squares methods: autocorrelation, such as when coverage rates in adjacent years (and therefore the error terms on adjacent observations) are correlated with each other; and heteroskedasticity, or non-equal variance of errors. More robust methods are therefore required. We therefore used OLS regressions with year dummies to correct for inter-year correlations, and Huber-corrected standard errors to provide parameter estimates robust to panel heteroskedasticity. Our coefficients therefore represent the *between*-country (cross-sectional) effects of the variables of interest. Although Generalized Estimating Equations (GEE) would have been a more efficient approach, with neither year dummies nor the associated loss in degrees of freedom but an adjustment for autocorrelation nonetheless, estimations carried out using GEE require the correlation structure of the data to be specified correctly and may be inaccurate if this is not the case (Diggle, Liang, and Zeger 1994). In view of this, and given the limited impact of year dummies on the degrees of freedom available, we adopted the former, simpler approach and used GEE as a way of checking the models thus constructed. The reported results are therefore all from OLS models with year dummies and Huber-corrected standard errors.[22]

An additional problem with using immunization coverage as a dependent variable is posed by the bounded nature of this variable. It is impossible to obtain coverage rates above 100 percent or below zero, but an estimation based on absolute rates can lead to

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countries) was seen to correspond to the income thresholds adopted in subsequent reports. For more, see World Bank (2001c)

[22] Another alternative would have been to use a fixed effects model with robust standard errors to correct for panel heteroskedasticity and year dummies to correct for inter-year correlations. By contrast to GEE, coefficients from which represent the cross-sectional (or between-country) effects of the variables of interest, coefficients from a fixed effects model represent the *within*-country, time-series information in the data. These models are therefore inappropriate for our data, since the decentralization status of most countries did not change during the study period and would therefore have been ignored in a fixed effects analysis. Fixed effects models are also computationally inefficient, since they are equivalent to including a dummy variable for each unit (country) in the data set.

models that predict rates outside of this range. To prevent this, a logit transformation can be applied to the dependent variable, and models can be constructed using the transformed variable instead of the original rates. In practice, however, the coefficients that result from such an analysis are difficult to interpret—especially by contrast to simple coverage rates, where the coefficients represent the percent change in immunization coverage associated with a given variable—and the outcome may in any case be the same. We therefore used logit-transformed data to construct and test the models but report our findings using the untransformed variables for ease of interpretation.[23]

Several caveats are worth mentioning. Decentralization is a complex phenomenon, and the use of quantitative methods with a small number of control variables runs the risk of over-simplification: hence, perhaps, the heavy reliance on case studies and qualitative methods in the decentralization literature so far. However, as McClure (1995) points out, cross-national analysis *can* provide insights into how concepts and theory translate into practice, in the aggregate at least, and it can indicate general trends that might otherwise be masked by the "strong prior beliefs" that characterize much of the literature on decentralization (Litvack, Ahmad and Bird 1998). While cross-national studies can not (nor should they) provide country-specific policy prescriptions, they *can* improve our understanding of how phenomena such as decentralization work in general terms, and are useful when interpreted in this light. Two interpretive issues are worth mentioning specifically, however. First, given the between-country, cross-sectional interpretation of our coefficients (as explained earlier), there remains the possibility that the observed relationships are confounded by other, unobserved variables. The inclusion of a wide range of control variables mitigates against this to some extent, but in the absence of data on coincident reforms[24]—and without a long enough time period to look at within-country changes, in which each country would serve as its own control and unobserved variables would be less of an issue—the

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[23] For another example, see Over's (1997) analysis of the effect of societal variables on rates of urban HIV infection in developing countries.

[24] Decentralization might be acting as a proxy for other reforms. For example, countries that adopt decentralization policies might also adopt user fees or other reforms that reduce the demand for immunization. If this were the case, then the coefficient on the decentralization variable would represent not only the effect of decentralization but also of these other reforms. Interpreting it as the pure effect of decentralization would therefore be biased. In this study, we assume no correlation between decentralization and other reforms. Although we have no way of testing this empirically, we argue its validity on two grounds. First, decentralization is essentially a political reform. As such, the factors that motivate it are fundamentally distinct from those that motivate sector-specific reforms such as user charges or hospital autonomy, even if they may coincide in time, principle or practice. Second, almost all the decentralized countries in our data set were already decentralized by 1980. This was prior to the widespread adoption of user charges and related health reforms in the late 1980s and early 1990s, so a temporal coincidence between the two is therefore unlikely. This might have been different if our interest was in health system decentralization (i.e., deconcentration), which *was* promoted as part of health reform efforts in the late 1980 and beyond; but since our interest is in political decentralization, it is less of a concern.

possibility of confounding remains open.[25] Second, causal inferences must be drawn with caution. This is a standard problem in statistical interpretation but is frequently overlooked in practice. Attributions of cause and effect must therefore remain speculative, however strong the statistical relationships observed.

The choice of interaction terms was driven by a combination of theoretical and practical concerns. On democracy, most theorists have proposed a positive interaction between democratic government and political decentralization, usually because of the assumption that democratic elections will improve the accountability of decentralized authorities (Mookherjee 2001). This does not always manifest in practice, however. Sundar (2001) describes how democratically elected local governments in India have been captured by economic and political elites at the village and township levels, and how the involvement of these groups has distorted the priorities of local governments and led to participatory processes based less on social capital than "old-fashioned capital" (p. 2007). On ethnic heterogeneity, most authors speculate a positive interaction with political decentralization, either because of the latter's effect on political stability (which is assumed to improve when diverse ethnic and linguistic groups are "closer" to the government) or because of the improved ability of decentralized governments to tailor their programs and services to the needs and preferences of these populations (La Porta and others 1999; Azfar, Kähkönen, and Meagher 2001). The interaction between decentralization and national income is included to follow up on observations published by Robalino, Picazo and Voetberg (2001) on the relationship between decentralization and infant mortality rates, which suggested a negative relationship in low-income countries and a positive relationship in middle-income countries, and a similar observation for the relationship between democracy and immunization coverage in Gauri and Khaleghian (2002). The interaction with development assistance was included to test the proposition that development agencies prefer working in centralized settings over decentralized ones (Dollar and Pritchett 1998). Given the traditionally vertical nature of most immunization programs (and the equally vertical nature of the World Health Organization's own Expanded Programme on Immunization), this question has special relevance to immunization and is well-suited to being tested when immunization rates are the dependent variable. Finally, several other interactions were tested but proved insignificant. These included literacy rates, institutional quality, income inequality and access to communication technologies. These are discussed at greater length in the Findings section below.

Table 1 presents summary statistics for the variables used in our regressions. There were 2,132 potential observations in the data set, each representing a single

[25] In this analysis, the time-series information in the data is ignored: each observation on a given country is treated as a separate observation, adjusted for time effects, and thus increases the sample size; but the analysis does *not* look at changes over time, since for most countries there was no change in their decentralization status from 1980 to 1997 and a longitudinal analysis would therefore provide no relevant information.

country-year for all low and middle-income countries over an 18-year period.[26] Excluding observations with missing data for the dependent variables reduced this to 736 potential observations in low-income countries and 1396 in middle-income countries. Excluding observations with missing data for key independent variables—log of GDP, log of population size, log of population density, participation in the UNICEF's Vaccine Independence Initiative, democracy score, institutional quality score, illiteracy rate and ethnic tension score, as reported in the basic regressions in Table 2—reduced these numbers to approximately 330 and 380 observations for low and middle-income countries respectively. In 1997, there were 57 low-income countries and 81 middle-income countries in the data set. Using these figures as an approximation for the entire period, there were an average of six observations for each low-income country and five for each middle-income country. The actual number of observations per country is likely to have be higher than this, since there were a number of countries in each income group for which no data were available at all. Observations with missing data were only weakly correlated with coverage rates (Table 1), suggesting that the missing data are not biasing the results. Tables 2, 3, and 4 present the results of our empirical analysis. Table 2 reports results for the entire data set, in which low and middle-income countries are included together. Tables 3 and 4 repeat the regressions for each group separately. Except as reported otherwise, regression coefficients were obtained using OLS with year dummies and robust variance estimation.[27] Most estimations obtained R^2 values of around 0.58. Leaving out the year dummies reduced this by a surprisingly small amount, to around 0.55. The inclusion of dummy variables for each geographic region did not significantly change any of the coefficients or findings reported below, even though countries in Eastern Europe and the former Soviet Union had significantly higher coverage rates than those in other regions.[28] Table 6 presents results from the original DPI data set separately from those obtained from the additional data on decentralization status. Throughout the paper, 95 percent confidence intervals are indicated in square brackets, and the term "percent change"—when used in reference to immunization coverage—refers to the *absolute* change in percent coverage with a given vaccine, not the relative change (e.g,. an increase in coverage from 55 to 75 percent is recorded as a "20 percent increase").

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[26] This number only includes country-years for which GDP data were available. Without GDP data, countries could not be classified into an income category for the purposes of this calculation. Gaps in GDP data were more pronounced in earlier years. This explains the difference between the number of actual observations (i.e., 2,132) and the number of expected observations calculated by using the number of low- and middle-income countries in 1997 as an estimate (i e., 57 low- and 71 middle-income countries multiplied by 18 years, or 2,484).

[27] GEE estimations produced broadly similar results to those reported in these tables, as did the use of logit-transformed dependent variables. The only exception was the variable for participation in UNICEF's Vaccine Independence Initiative, which was unstable in GEE estimations and ranged from strongly positive to strongly negative in these regressions. This variable was significant and positive in all regressions carried out using robust OLS with year dummies.

[28] Especially surprisingly was the fact that including regional dummies for Eastern Europe and the former Soviet Union did *not* significantly change the coefficients or findings regarding democracy or decentralization. Neither did leaving these countries out of the analysis altogether.

Table 1. Summary statistics, low- and middle-income countries

				Mean values in low and middle income countries		Correlation with vaccine coverage		Correlation with missing data flag	
	Mean	SD	N	Low	Middle	DTP3	Measles	DTP3	Measles
Decentralization	0.24	0.42	1244	0.21	0.26	0.16	0.07	0.11	0.04
log GDP per capita	6.98	1 13	2047	5.76	7.62	0.46	0.37	–0.11	–0.09
log total population	15 38	2.06	2132	15.95	15.08	–0.11	–0 07	.	.
log population density	3.81	1 39	2067	3.81	3.80	0.24	0.17	0.01	0.01
Participation in VII	02	0 15	2132	0 02	0.03	0 04	0.04	.	.
Democracy score	3 39	3 82	1701	1.97	4.34	0.33	0.25	0.15	0.11
Institutional quality	15.96	4.81	1263	14.20	16.90	0.55	0.49	–0.01	–0.003
Illiteracy rate	34.12	24.62	1729	51.55	23.64	–0.54	–0.51	0.12	0.12
Ethnic tension	2.41	1.50	1265	3.00	2.09	–0.35	–0.36	–0.01	0.0003
Aid per GNP	9.71	14.21	2022	17.11	5.47	–0.1	–0.13	0.14	0.13

Table 2. Combined regressions, low and middle-income countries together, DTP3 and measles

	Linear terms, DTP3			Quadratic terms, DTP3		
N	707			707		
R^2	0.5944			0.5906		
	Coefficient	SE	Sig.	Coefficient	SE	Sig.
Decentralization	16	4.3	***	19.06	4.56	***
log GDP per capita	4.42	1.2	***	7.69	1.42	***
log total population	–0.67	0.5		–0.38	0.52	
log population density	3.49	0.55	***	3.03	0.59	***
Participation in VII	12.43	2.82	***	9.87	3.44	***
Democracy score	4 28	0.54	***	3.76	0.61	***
Institutional quality	1.4	0.2	***	1.44	0.2	***
Illiteracy rate	–0.42	0.04	***	–0.39	0.037	***
Ethnic tension	–3.46	1.12	***	0.14	1	
Democracy * log GDP	–2.7	0.33	***			
Decentralization * log GDP	–9.7	2 57	***			
(Democracy * log GDP)^2				–0.078	0.012	***
(Decentralization * log GDP) ^2				–0.36	0.085	***
Ethnic tension * log GDP	1.48	0.65	***	–0.81	0.6	
Aid per capita * log GDP	0.26	0.06	***	0.29	0.06	***
	Linear terms, measles			Quadratic terms, measles		
N	689			689		
R^2	0.5855			0.5795		
	Coefficient	SE	Sig.	Coefficient	SE	Sig.
Decentralization	15 53	4.97	***	13 4	5.41	**
log GDP per capita	3.63	1.19	***	5.61	1.37	***
log total population	0.45	0.48		0.68	0.5	
log population density	1.99	0.58	***	1 77	0.6	***
Participation in VII	11.36	2.5	***	9.52	2.9	***
Democracy score	2.62	0.58	***	2.3	0.64	***
Institutional quality	1.14	0.23	***	1.18	0.23	***
Illiteracy rate	–0.31	0 038	***	–0.29	0.04	***
Ethnic tension	–6.53	1.15	***	–3.93	1.1	***
Democracy * log GDP	–1.75	0.34	***			
Decentralization * log GDP	–9.94	2.95	***			
(Democracy * log GDP) ^2				–0.05	0.01	***
(Decentralization * log GDP) ^2				–0.27	0.1	***
Ethnic tension * log GDP	1.89	0.66	***	0.26	0.64	
Aid per capita * log GDP	0.21	0.06	***	0.23	0.06	***

Key * = 0 05 < $p \leq$0 10, ** = 0.01 < $p \leq$0.05, *** = $p \leq$0.01

8. Findings

1. Decentralization is associated with higher immunization coverage rates in low-income countries, but lower coverage in middle-income countries.

The parameter estimate for the decentralization variable is large and statistically significant in both low and middle-income countries. Surprisingly, however, the sign of the coefficient is different for each: it is *positive* in low-income countries, indicating higher coverage rates in decentralized countries than centralized ones, and *negative* in middle-income countries, indicating the reverse (Tables 3 and 4).[29] Other things being equal, decentralization is associated with an 8.8 percent *increase* in DTP3 coverage in low-income countries [3.9, 13.7] but a 4.9 percent *decrease* in DTP3 coverage in middle-income countries [1.5, 8.4]. Similar results were obtained with the measles vaccine, where the coefficients were 8.3 percent for low-income countries [3.2, 13.4] and negative 5.5 percent for middle-income countries [1.9, 9.2]. A simple comparison of mean coverage rates in decentralized vs. centralized middle-income countries suggests the same relationship (Table 5). Country examples also support this finding. For example Benin, a decentralized low-income country with a GDP per capita of $387 in 1997, reported coverage rates of 78 and 82 percent for the DTP3 and measles vaccines respectively; whereas its neighbor Togo, a centralized country with a slightly lower per capita GDP of $345, reported coverage rates of 33 and 38 percent for these vaccines in the same year. Among middle-income countries, Venezuela, a decentralized country with a per capita GDP of $3,600, reported coverage rates of 60 and 68 percent for DTP3 and measles in 1997; whereas Costa Rica, a centralized country with a similar income level (GDP per capita $3,550) reported rates of over 90 percent for both.

[29] In Table 4, the negative coefficient on the variable for log of GDP per capita is caused by one outlier country, Malawi. Removing Malawi from the regressions changes the sign on this variable and makes it lose significance. The other parameter estimates remain unchanged.

Table 3. Regression results, middle-income countries

	DTP3, basic regression			Democracy interaction, DTP3			Ethnic tension interaction, DTP3		
N	388			300			300		
R^2	0.5449			0.5844			0.5981		
	Coeff.	SE	Sig	Coeff.	SE	Sig.	Coeff.	SE	Sig.
Decentralization	−4 92	1.76	***	−15.94	4.54	***	−17.41	3.2	***
log GDP per capita	2.65	1.56	*	1.29	1.86		2.44	1.97	
log total population	−1 18	0.6	**	−0.19	0.71		0.21	0.68	
log population density	1 15	0.64	*	1.01	0.66		−0.033	0.66	
Participation in VII	10.33	2.53	***	1.8	3.71		2.78	3.22	
Democracy score	−1.49	0.27	***	−2 32	0.31	***	−2.21	0.31	***
Institutional quality	1 09	0.25	***	1.48	0.3	***	0.97	0.35	***
Illiteracy rate	−0 41	0.06	***	−0.37	0.081	***	−0.39	0.08	***
Ethnic tension	−1 54	0.68	**	−2.35	0.76	***	−4.54	0.94	***
Decentralization * Democracy				1.35	0.61	***			
Decentralization * Ethnic tension							5.68	1.38	***

	Measles, basic regression			Democracy interaction, measles			Ethnic tension interaction, measles		
N	377			293			293		
R^2	0.5908			0.6386			0.6242		
	Coeff.	SE	Sig.	Coeff.	SE	Sig.	Coeff.	SE	Sig.
Decentralization	−5.51	1.87	***	−20.7	4.48	***	−9.87	3.32	***
log GDP per capita	2 73	1.5	*	2.11	1.84		3.1	1.89	
log total population	−0.23	0.56		0 99	0.69		0.59	0.74	
log population density	0.56	0.69		0.22	0.73		−0.21	0.73	
Participation in VII	6.57	2.57	**	−4.62	3.05		−2.12	2.78	
Democracy score	−1.52	0.27	***	−2.49	0.33	***	−2.01	0.31	***
Institutional quality	0 92	0 29	***	1 22	0.3	***	1.16	0.34	***
Illiteracy rate	−0.35	0.06	***	−0.35	0.071	***	−0.32	0.074	***
Ethnic tension	−3.63	0.69	***	−4.04	0.82	***	−3.96	0.95	***
Decentralization * Democracy				1.82	0.63	***			
Decentralization * Ethnic tension							4.88	1.78	***

Key. * = 0 05 < p ≤0 10, ** = 0 01 < p ≤0 05, *** = p ≤0 01.

The models in Table 2 illustrate these differences by including an interaction term for decentralization and the log of per capita GDP. These indicate that the effect of decentralization turns negative at a per capita GDP of around $1,400 (in constant 1995 US dollars), somewhat higher than the previously noted crossover point for the democracy variable (Gauri and Khaleghian 2002). The models in the third column modify this approach by using a quadratic term for the interaction between the log of per capita GDP—now squared—and the decentralization variable, following the example of Robalino, Picazo and Voetberg (2001). The significance of this variable suggests an L-shaped relationship between the effect of decentralization on immunization coverage and national income: a positive relationship in low-income countries, a negative relationship in middle-income countries, and a stabilization of this negative relationship as income rises. Figure 1 illustrates this graphically.

Table 4. Regression results, low-income countries

	DTP3, basic regression			Aid term and interaction, DTP3		
N	331			331		
R^2	0.6568			0 6612		
	Coefficient	SE	Sig.	Coefficient	SE	Sig.
Decentralization	8.81	2.49	***	12.96	3.41	***
log GDP per capita	–4.34	2.18	**	–2 83	2.42	
log total population	–3.74	0 68	***	–3 28	0.87	***
log population density	6.13	0.87	***	6.147	0.87	***
Participation in VII	15.92	4.21	***	16.56	4.24	***
Democracy score	1.97	0 29	***	1.9	0.29	***
Institutional quality	1.85	0.33	***	1 69	0.34	***
Illiteracy rate	–0.49	0.05	***	–0.49	0.048	***
Ethnic tension	–1.4	0.82	*	–1.41	0.83	*
Aid per GNP				0 16	0.07	**
Decentralization * Aid/GNP				–0.51	0.2	**
	Measles, basic regression			Aid term and interaction, measles		
N	324			324		
R^2	0.5749			0.5817		
	Coefficient	SE	Sig.	Coefficient	SE	Sig.
Decentralization	8.27	2.61	***	11.65	3 71	***
log GDP per capita	–6.54	2.27	***	–5.23	2.47	
log total population	–1 99	0 65	***	–1.57	0 81	*
log population density	3.73	0.94	***	3.76	0.94	***
Participation in VII	17 29	4.12	***	17 79	4.15	***
Democracy score	1.37	0.33	***	1.32	0.32	***
Institutional quality	1.62	0.36	***	1.49	0.37	***
Illiteracy rate	–0.38	0.06	***	–0.38	0.06	***
Ethnic tension	–3.99	0.86	***	–3.98	0.87	***
Aid per GNP				0.14	0.07	*
Decentralization * Aid/GNP				–0.4	0 2	**

Key * = 0 05 < $p \leq 0$ 10, ** = 0.01 < $p \leq 0$ 05, *** = $p \leq 0$ 01

Table 5. Mean DTP3 and measles coverage, by income level and decentralization status

DTP3, %	Income level		
	Low	Lower-middle	Upper-middle
Centralized	54.1	70.4	82.4
Decentralized	67 5	70.8	81 8

Measles, %	Income level		
	Low	Lower-middle	Upper-middle
Centralized	55.7	71.5	77.9
Decentralized	65.5	70.8	67.6

Income level cutoffs: $965, $3,000 and $9,400 in constant 1995 U.S dollars

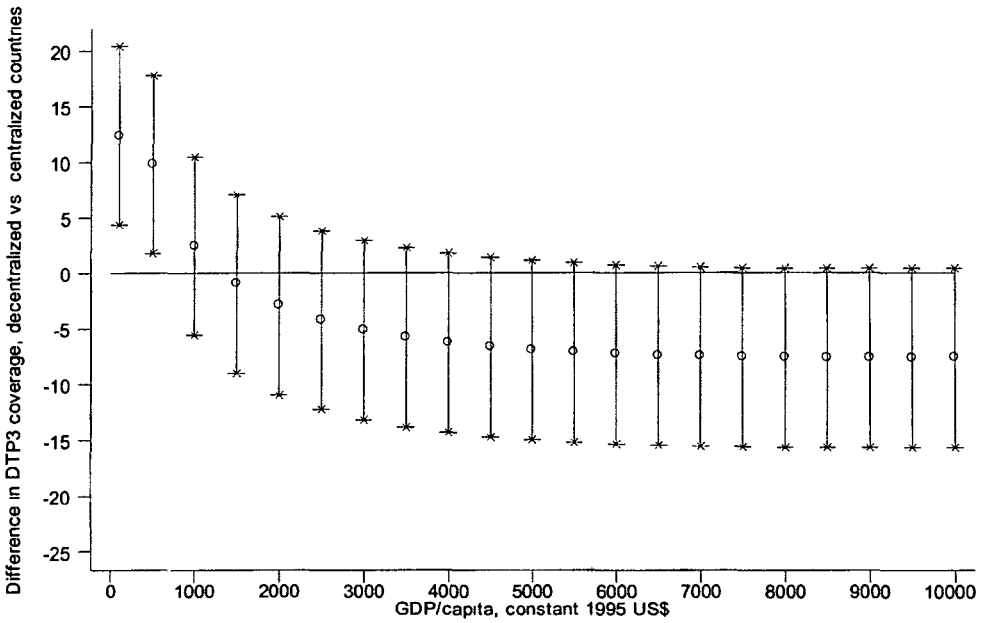
Table 6. DPI data vs. additional data on decentralization status

	Combined data set, DPT3			DPI data, DPT3			Additional data, DPT3*		
N	707			370			337		
R^2	0 5944			0 6456			0 6697		
	Coeff	SE	Sig.	Coeff	SE	Sig.	Coeff.	SE	Sig.
Decentralization	16	4.3	***	24.59	12.1	**	4.17	6.29	
log GDP per capita	4.42	1.2	***	11.42	2	***	6.02	2.01	***
log total population	–0.67	0.5		1 31	0 66	**	–2 66	0.85	***
log population density	3.49	0.55	***	1 98	0 69	***	5 39	0.84	***
Participation in VII	12.43	2.82	***	10.68	2 94	***	–2.45	5.31	
Democracy score	4.28	0.54	***	7 48	1 51	***	2 17	0.73	***
Institutional quality	1 4	0.2	***	0 85	0.27	***	1.52	0.29	***
Illiteracy rate	–0.42	0.04	***	–0.03	0.1		–0.58	0 04	***
Ethnic tension	–3 46	1 12	***	–9 92	2.69	***	–2.24	1.46	
Democracy * log GDP	–2.7	0.33	***	–3.95	0.8	***	–0.69	0.51	
Decentralization * log GDP	–9.7	2.57	***	–16.92	6.18	***	0.96	4.6	
Ethnic tension * log GDP	1.48	0.65	***	4 31	1.38	***	0.61	1.06	
Aid per capita * log GDP	0.26	0.06	***	0.24	0.09	***	0 14	0.07	*

	Combined, measles			DPI data, measles			Additional data, measles*		
N	689			359			330		
R^2	0.5855			0.6492			0.6354		
	Coefficient	SE	Sig.	Coeff.	SE	Sig.	Coefficient	SE	Sig.
Decentralization	15 53	4 97	***	9	4 65	*	7.93	6.6	
log GDP per capita	3 63	1 19	***	11	2 07	***	8	2.14	***
log total population	0.45	0 48		2.17	0.72	***	–1.09	0.81	
log population density	1 99	0.58	***	0 89	0 81		2.96	0.93	***
Participation in VII	11.36	2 5	***	8 54	3.15	***	–1.31	4.9	
Democracy score	2.62	0.58	***	6.06	1 63	***	1.05	0 78	
Institutional quality	1 14	.0 23	***	0 54	0 31	*	1.51	0.33	***
Illiteracy rate	–0.31	0.038	***	–0.005	0.1		–0 44	0.06	***
Ethnic tension	–6 53	1.15	***	–10.29	2.91	***	–5.81	1.49	***
Democracy * log GDP	–1 75	0.34	***	–3.72	0 88	***	0.18	0.53	
Decentralization * log GDP	–9.94	2.95	***	–9.67	6.48		–0 12	4.78	
Ethnic tension * log GDP	1 89	0.66	***	3.4	1.45	**	1.61	1.05	
Aid per capita * log GDP	0 21	0.06	***	0.27	0.1	***	0.1	0.08	

Note: The weaker results from the additional data probably reflect the fact that most of these data were for non-decentralized countries. That is, the supplementary data added a majority of "zeroes" to the data set, and relatively fewer positive observations. In the DPI data set, there were 526 observations (i.e., country-years) on centralized countries and 435 observations on decentralized ones; in the supplementary data, these figures were 648 and 66 respectively. The overall data set included data on 1174 centralized and 501 decentralized country-years.

Figure 1. Independent effect of decentralization on immunization coverage, vs. GDP per capita



What explains this difference in the effect of decentralization between low and middle-income countries? In particular, why do low-income countries have such a strongly positive coefficient when both theory and reported practice would lead us to expect the opposite?

Statistical confounding is one possibility, whereby the relationship between decentralization and immunization coverage in low-income countries is mediated by a third factor—not observed—that is simultaneously correlated with both the decision to decentralize and the capacity to obtain high levels of immunization coverage.[30] The inclusion of numerous control variables mitigates against this interpretation, as does the fact that similar relationships have been observed for decentralization and infant mortality rates by Robalino, Picazo and Voetberg (2001) and for democratic government, immunization coverage and the adoption of new vaccines by Gauri and Khaleghian (2002).[31] A related possibility is that decentralized low-income countries may have started with higher coverage rates than their centralized counterparts, giving them a "head

[30] In other words, a kind of selection bias may be at work here, whereby it isn't decentralization that leads low-income countries to have better coverage rates, but rather that countries with better rates tend to be those that decentralize first. This is actually a form of confounding, since the underlying factor, i.e., the variable that causes some countries to decentralize and others to not, is unknown and simultaneously correlated with both coverage rates and decentralization status.

[31] These results might also have been subject to confounding. In the case of Robalino, Picazo and Voetberg (2001), their independent variable, fiscal decentralization, is reasonably similar to the one we use here. Gauri and Khaleghian's (2002) findings on the effect of democratic government might also be related to ours, both theoretically and statistically (if democratic government and decentralization are both motivated by similar underlying factors, for example).

start" over these countries and biasing regressions that use absolute coverage rates as a dependent variable. To check this, we created a new dependent variable by taking the difference between a country's first-recorded rate (usually from 1980, but in some cases from 1981 or 1982) and the observed coverage rate in each subsequent year. No significant change in the relationship was observed using this variable, nor was there any difference when logit-transformed dependent variables were used.[32] The models were also run for different subsets of the study period (1980-84, 1985-89, 1990-97) with no significant change to the results.[33]

Assuming the observed difference between the decentralization effect in low and middle-income countries not simply a statistical artifact, the question turns to *why* such a difference exists. Reasons for the observed relationship in middle-income countries—where decentralization is associated with lower coverage rates, other things being equal—have been discussed already, in earlier sections of this paper. What is *not* so clear is why these effects are not observed in low-income countries, and why these countries' results are in fact the complete opposite of those predicted by both theoretical accounts and published reports.

Several explanations are possible. First, decentralization in low-income countries may be associated with a greater retention of central influence than in middle-income countries, where the demand for local autonomy may be greater and the devolution of central functions correspondingly more extensive. This is usually considered a harmful design flaw in decentralized systems, since it limits the autonomy of local governments and therefore reduces related benefits such as inter-jurisdictional competition and the production of locally differentiated services. For immunization programs, however, the "failure" of a central government to give up certain essential functions—such as monitoring and evaluation, or disease surveillance—may actually be a good thing, especially in view of the wide range of central activities necessary to the effective

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[32] This is not a perfect method, as it doesn't take into account the increasing difficulty of raising immunization coverage once coverage rates get above 80 to 90 percent. Thus, while designed to equalize countries vis-à-vis their starting point, it may excessively penalize high-achieving countries and give too great a benefit to countries starting with very low rates. A similar effect is observed when using first differences, but with even more extreme penalties for high-achieving countries that make small annual increments. This effect is less pronounced in our approach because a single, early baseline is used, rather than the "moving" (annual) baseline implicit in using first differences. Logit transformation—which linearizes the S-shaped curve of immunization time-series and allows the specification of a "ceiling" rate (taken here as 95 percent) against which to compare the rates in each country-year—provides an even better dependent variable, as described earlier.

[33] The observed relationships were robust to a wide variety of changes in both the data and the specification of the model. For low-income countries, excluding India and Nepal—both of which are known to over-report immunization coverage—made no difference to the results. Neither did removing India, Sri Lanka and Bangladesh together, all of which had high-leverage observations. Removing former Soviet Bloc countries (which are known *ceteris paribus* to have obtained higher coverage levels than their non-Soviet Bloc counterparts) also made no appreciable difference either. (In fact, the strength of the observed relationship between decentralization and immunization coverage in low-income countries is made all the more remarkable by the fact that these countries are included in the centralized group and might therefore have been expected to bias the results in the opposite direction.)

functioning of an immunization program and the harmful consequences of decentralizing these. Low-income countries may also give immunization greater priority among their health objectives, given their higher prevalence of communicable diseases,[34] and if decentralized may transmit this to lower-level authorities for implementation.

Second, local authorities in low-income countries may have greater bureaucratic autonomy than those in middle-income countries. This is a two-edged sword. On the one hand, it provides local authorities with the influence necessary to coordinate the wide range of activities involved in a well-functioning local immunization program, and it gives them the freedom to innovate and experiment while doing so; but on the other hand, it can hinder efforts to improve accountability and limit opportunities for community members to express their preferences and concerns. If local authorities are instructed by the center to consider immunization a priority, and if they remain relatively more responsive to central directives than to community demands,[35] then their proximity to the community and their knowledge of local circumstances can lead to a significant positive impact on immunization coverage. But if they face less central direction, or if they face a greater diversity (or louder expression) of demands from the local community, then the impact may be negative, as seen in middle-income countries.

Third, low and middle-income countries may differ in the nature and extent of community participation. In low-income countries, community mobilization might have a more pragmatic character, with community members being called upon to help in national immunization days or other practical activities rather than being consulted for their views on the quality of services or their input into resource allocation decisions (Brinkerhoff 2000). In middle-income countries, by contrast, community involvement is likely to focus less on practical participation in immunization-related activities and more on providing input to resource allocation and priority-setting debates. This can be problematic for immunization, as discussed earlier, since communities—when given the choice—frequently opt for a focus on curative services over preventive ones, and may indeed opt for other, non-health services altogether. Local authorities in low-income countries, faced with fewer such demands (either because there are fewer channels for expression or because they have sufficient bureaucratic autonomy to resist them), may therefore be in a better position to focus on immunization than their middle-income country counterparts, and at the same time in a better position to implement immunization-related tasks—given their proximity to the community and their greater autonomy in dealing with it—than their centralized counterparts in the low-income group.

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[34] Also relevant is the interest of donor nations and development agencies in controlling these diseases, as recently re-stated in the Millennium Development Goals and their heavy emphasis on communicable disease prevention and control.

[35] Even in a decentralized system, local bureaucrats may remain "closer" to their central counterparts than to local political executives, from whom they may be more distant because of differences in class, caste, professional background and personal allegiances, among other things.

A fourth possibility concerns accountability. For reasons that have been discussed already, immunization services are seldom the focus of community efforts to hold local authorities accountable for the services they provide. But in low-income countries, where health services are among the most visible manifestations of government presence at the local level, these services may form an important focus of public demands for improved performance. While these demands are unlikely to focus on immunization specifically, the importance of immunization among primary health services—and the fact that it is frequently delivered from the same government facilities as low-level curative services, which are the more likely focus of public concern—may result in a positive effect on immunization programs as well. This is less likely in middle-income countries, where a wider range of government services are provided (and where public knowledge of these programs may be better), and where communities are therefore more likely to hold officials accountable for other, non-health services—or within health, for curative services rather than preventive ones—instead.

Broadly speaking, these results suggest that low-income countries get the "best" out of decentralization—as far as immunization is concerned, at least—while middle-income countries get the worst. In low-income countries, the positive coefficient may reflect a salutary balance between the proximity of local authorities to the community (and related effects such as their improved knowledge of local circumstances, their freedom to adapt services to these conditions, and the local community's ability to monitor their performance) and the preservation of central influence and bureaucratic autonomy, both of which are essential to the effective functioning of an immunization program. In middle-income countries, the negative coefficient may reflect the reverse: namely, a greater devolution of central powers to local authorities, including immunization-related functions that should remain centrally supervised; local authorities with closer links to the community than the center, resulting in a preferential responsiveness to community demands and a corresponding lack of attention to centrally determined priorities; a louder and more diverse range of community demands, including for services *other* than immunization; and less accountability from the community for preventive or primary health services as compared with curative services or other, non-health concerns.[36] Differences in the policy emphasis given to immunization may also play a role.

Still, the magnitude of these effects remains striking. In low-income countries, the positive effect of decentralization is approximately the same, on average, as that of an 20 percent increase in the literacy rate, while in middle-income countries, the effect is

[36] By contrast, the reasons for a positive coefficient in *low-income* countries may include a greater retention of central influence, a stronger policy focus on immunization compared to other health services, local authorities with closer links to the center than the community, fewer demands from the community (or fewer channels to express them), and more accountability from the community for immunization services because of their connection to primary health care and the visibility and importance of these services to the community at large—unless it is just a self-selection bias (i.e., something correlated with low-income countries' choice to decentralize in the first place), which it might well be.

equivalent to that of a 15 percent *decrease* in this rate. Other comparisons can be made using the coefficients on Tables 3 and 4.

2. **In middle-income countries, democratic government mitigates the negative effect of decentralization; but surprisingly, institutional quality does not.**

In middle-income countries, decentralization and democratic government are both associated with lower immunization coverage rates. For a typical middle-income country, a one-point increase in the democracy variable (on a scale from zero to ten) is associated with a 2.3 percent decrease in DTP3 coverage [1.7, 2.9] and a 2.5 percent decrease in measles coverage [1.8, 3.1], other things being equal (Table 3). This result has been discussed elsewhere (Gauri and Khaleghian 2002) and is not reviewed in detail here. Unexpectedly, however, the coefficient on the interaction term between democracy and decentralization is positive. This can be interpreted in two ways: either that democracy mitigates the negative effects of decentralization, or vice versa.

The first interpretation, that democracy mitigates the negative effects of decentralization, goes against theoretical expectations about the impact of community participation in middle-income countries. If democracy gives a louder voice to community preferences, and if these preferences are for goods and services *other* than immunization, then we might expect immunization to be "crowded out" of the agenda of local governments and a negative relationship to ensue. This would correspond to a *negative* sign on the interaction term for democracy and decentralization, which is the reverse of what we observe. But if democratic government stimulates a higher level of government accountability overall, and if this accountability improves the performance of the government's functioning as a whole, then this improvement might be more visible in decentralized countries—where opportunities exist for *local* as well as central accountability—and immunization may benefit as an indirect result.

The second interpretation, that decentralization mitigates the negative effects of democracy, may reflect differences in the democratic process between centralized and decentralized countries.[37] Democracy without decentralization may strengthen the influence of national-level elites who typically have little interest in preventive health care, with negative implications for services such as immunization.[38] Decentralization can mitigate this by facilitating a broader range of inputs to the democratic process—including those of rural or poor constituencies, for example—and in turn can elevate the position of immunization (or, more probably, primary health services in general) on the policy agenda.

In either case, the magnitude of the interaction effect is relatively small, and even under the most favorable of circumstances it continues to be dominated by the

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[37] See Manor (1999) for further discussion.

[38] In these countries, political participation takes place only at the central level, and local officials (where they exist) are simply the field functionaries of deconcentrated central agencies. Examples of centralized countries with high democracy scores include Costa Rica, Greece, Hungary after 1990, Lithuania after 1991, and Mongolia after 1992.

independent (and negative) effects of decentralization and democracy themselves. Separately, decentralization and democracy are associated with 15.9 and (a maximum) 23.2 percent reductions in DTP3 rates respectively, for a total difference of 39.1 percent between decentralized, democratic countries and centralized, autocratic ones. Adding the interaction term reduces this significantly, to 25.6 percent, but the overall relationship remains negative.[39] No such effects are observed in low-income countries, in which democracy and decentralization are both independently associated with *higher* coverage rates but no interaction exists.

The non-significance of an interaction term for decentralization and institutional quality is harder to explain.[40] Given the importance of management capacity as a determinant of local government functioning in decentralized systems, one would *a priori* expect a positive and significant coefficient on this variable.[41] No such effect is observed. The variable for institutional quality—a composite of various determinants of government functioning, and used here as a proxy for the quality of governance—*does* have an highly positive effect on coverage rates, with approximately the same magnitude in low and middle-income countries. But this effect is the same in both centralized and decentralized settings, suggesting that the effectiveness of decentralization may rely less on administrative quality, as highlighted in numerous case studies, and more on other issues (such as the division of central-local responsibilities, or the extent to which these services are protected by central mandates and tied funds) instead. This can only be a tentative conclusion, since both intuitive logic and published reports support a strong role for management capacity as a determinant of good functioning in decentralized systems.

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[39] Removing former Soviet Bloc countries from the analysis did not change these results.

[40] Separate regressions (not shown) looked specifically at the influence of corruption on immunization coverage rates. Not surprisingly, a simple model predicting DTP3 coverage as a function of corruption found a strong relationship between the two, with corruption by itself explaining 17 percent of the variance in coverage rates. However, the corruption effect was not robust to the inclusion of control variables for income, democracy and institutional quality—here constructed without the corruption variable, with which it was not strongly correlated—and it did not appear to modify the relationship between decentralization and immunization coverage when included as an interaction term with the former. Both these findings are counterintuitive. The first runs counter to empirical studies of other public services, in which the independent effect of corruption generally remains significant even in the presence of other control variables. The second suggests that corruption does not modify the effectiveness of decentralization—or alternatively, that decentralization does not modify the effect of corruption—and therefore contradicts the findings of Fisman and Gatti (2000). In both cases, the explanation may lie in the low rent-extraction potential of immunization programs as compared with other government services. To illustrate: In a typical developing-country immunization program, vaccines and supplies are bought at the central level, often with donor funds or through international procurement schemes with stringent transparency requirements. These vaccines and supplies are then distributed to states, provinces, districts or even clinics, and are paid for with budgetary transfers at the central level. They are then used by health workers who deliver them in clinics or outreach programs for which (usually) no fees are charged. The opportunities for corruption in this kind of system are therefore quite limited, especially by contrast to other public services—such as pharmaceutical purchases or public works, for example—where financial transactions are more abundant or public demand is greater.

[41] In other words, that institutional quality would mitigate decentralization's negative effect in middle-income countries, and would reinforce its positive effect in low-income ones.

3. **In middle-income countries, decentralization reverses the negative effects of ethnic tension and ethnolinguistic fractionalization.**

Other things being equal, ethnic tension and ethnolinguistic fractionalization are both associated with lower coverage rates for DTP3 and measles in middle-income countries (Table 3). A one-point increase in ethnic tension (measured on a six-point scale) is associated with a 4.5 percent reduction in DTP3 coverage [2.7, 6.4], and a one percent increase in ELF is associated with a 2.3 percent reduction in coverage [1.6, 3.0].[42] What is more interesting, however, is that the interaction term for decentralization and ethnic tension (and a similar term using ELF instead of ethnic tension) has a *positive* coefficient.[43] Significantly, the coefficient is actually larger in magnitude than the (negative) coefficients on the ethnic tension and ELF variables alone, suggesting that decentralization not only mitigates the negative effects of ethnic tension and heterogeneity but actually *reverses* them. In other words, while ethnic tension and ELF are associated with lower coverage in centralized countries, they are actually associated with *higher* coverage in decentralized ones.

Centralization is therefore associated with a substantial advantage in countries with little or no ethnic heterogeneity or tension, but the advantage disappears—and becomes dominated by the positive effects of decentralization—once the ELF index reaches 0.57 or the level of ethnic tension reaches 3.1.

What explains these effects? By themselves, ethnic tension and heterogeneity can inhibit the development of strong national institutions and may divert government attention away from essential services (such as immunization) and toward the various exigencies of maintaining stability in a fractionalized environment (La Porta and others 1999). They can also pose difficulties for immunization programs, in which the need to communicate across ethnic and linguistic lines may compromise the ability of health workers to reach the entire population with essential vaccines. Decentralization can help address these problems in three ways. First, by distributing more widely the task of dealing with ethnic heterogeneity and the demands and tensions to which it gives rise,[44] it can allow the central government to focus on essential tasks (such as immunization) that might otherwise be dominated by the conflicting demands of different groups. Second, by moving the government "closer" to the community—and thus to the various ethnic or linguistic groups that compose it—it can strengthen the government's ability to respond to the diverse needs of these groups, thus potentially *reducing* such tensions. And third,

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[42] Results for ELF are not shown in Table 3 as they very closely followed those of the variable for ethnic tension.

[43] The correlation coefficient for ethnic tension and ethnolinguistic fractionalization is 0.48, suggesting that the two variables are measuring different but related phenomena. The example of Albania illustrates this point: with an ELF of 0.09, it is among the least ethnolinguistically diverse countries in the world; yet its ethnic tension score is 3.9, reflecting the extent of tensions between the few ethnically distinct groups that do exist. No significant difference was observed when using Roeder's (2001) updated ELF data for 1985 as compared with the original data of Taylor and Hudson (1972). The correlation between these two measures was R = 0.94.

[44] That is, by spreading the responsibility for governance across a larger number of units.

also by moving the government closer to the community, it can improve the performance of certain services—especially those for which tastes and preferences vary widely across groups, or for which local adaptation is important for other reasons—by enabling decentralized authorities to tailor them to varied local circumstances.

Immunization, as currently practiced in most countries, is a supply-driven technical intervention for which demand is limited, and it therefore seems an improbable candidate to benefit from the third of these effects. It *can*, however, be strengthened by the ability to tailor programs and materials locally, and these in turn can improve its ability to reach marginalized ethnic or linguistic groups (and thus increase immunization coverage),[45] so part of the observed effect—i.e., that decentralization has a less negative effect in ethnically or linguistically heterogeneous countries—may reflect these benefits. This finding is consistent with the theoretical expectations summarized earlier.[46]

Curiously, however, these results are only observed for DTP3 and not for the measles vaccine. This may reflect differences in the mode of delivery for these vaccines. DTP3, being the last of three sequentially administered vaccines, relies more heavily on routine health services for its delivery (and therefore provides a better reflection of how these services function) than measles, which as a single-dose vaccine can also be (and is often) administered during national immunization days and other "one off" activities outside the routine health delivery system.

4. **In low-income countries, development assistance is associated with a *reduction* in immunization coverage in decentralized countries, but an *increase* in coverage in centralized ones.**

Development assistance is associated with higher coverage rates for both DTP3 and measles in low-income countries (Table 4). This is in line with intuitive expectations about the role and impact of development assistance, and it may reflect technical cooperation and enhanced professional exchange as much as direct financial assistance *per sé*. Surprisingly, however, the coefficient on the interaction between development aid and decentralization is strongly negative. Thus, in decentralized countries, an increased level of development aid per capita is associated with a *reduction* in coverage rates, other things being equal, whereas in centralized countries the association is with an *increase* in these rates. The effect is not large, and the positive impact of decentralization continues to dominate up to aid levels of around 38 percent of GDP; but at more moderate levels—

[45] Another factor is the increased geographic reach engendered by decentralization, though this does not always happen automatically and can be a characteristic of non-autonomous deconcentrated field administrations as well.

[46] If a government chooses to decentralize as a result of ethnic tension or heterogeneity, then using both variables in the same regression would result in biased estimates due to the correlation between them This is a genuine concern in principle, since many authors have pointed to decentralization as a way of dispersing ethnic conflict or preventing political unrest among marginalized ethnic or linguistic groups (Collins and Green 1994; Manor 1999). In practice, however, the correlation between the ethnic tension and decentralization variables in our data was small, with an R of -0.21. The correlation between ELF and decentralization was even smaller, with an R of -0.12. Collinearity was ruled out by obtaining variance inflation factors after each regression.

aid levels of between 5 and 10 percent of GDP, for example—the positive relationship between decentralization and immunization coverage can be reduced (in relative terms) by 14 to 27 percent, other things being equal. (Even at these levels, however, decentralized countries do better than centralized ones. This effect reverses above aid levels of around 25 percent of GDP.)[47]

Several explanations are possible. In most countries, especially low-income ones, development assistance is channeled principally through central government institutions and less through local governments or community groups. This can be problematic in decentralized settings, since it reinforces a centralized approach and can undermine the decentralization process (Dollar and Pritchett 1998, p.86); and it can be especially problematic for immunization, in which decentralization is already complicated by the vertical design of most immunization programs and the historical tendency of donors to perpetuate this approach. From this perspective, the observed relationship in decentralized countries may reflect tensions between countries' decentralization processes and the centralizing tendency of donors, in which the benefits of decentralization prevail overall but are reduced when donors get involved. The observed relationship in centralized countries may reflect the opposite, i.e., a concurrence between donor and country approaches, both of them centralized and vertical. Another possibility is that donor involvement decreases the extent of community participation and therefore reduces the benefits of decentralization. Published reports from the period between 1980 and 1997 highlight the reluctance of many donor agencies to involve communities in their projects and activities (Dollar and Pritchett 1998). This has been especially true of some immunization-related activities, as discussed earlier (UNICEF 1996).[48]

A logical extension of these arguments is that measures of immunization-specific donor aid should have similar or stronger effects than measures of development aid in general. Surprisingly, however, this result was *not* found when using variables for participation in UNICEF's Vaccine Independence Initiative (VII) or PAHO's Revolving Fund, neither of which changed the effect of the decentralization variable. This may reflect the procurement-specific assistance provided by these programs, the benefits of which are principally related to the price and supply of vaccines rather than to programmatic factors affecting organizational arrangements that might interact with decentralization. A different result might have been obtained with variables for

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[47] The coefficients do not change significantly whether one measures development aid as a proportion of GNP, as we do in Table 4, or in per capita terms.

[48] Other explanations seem less plausible. Donors have actively promoted immunization programs in all countries, and a difference in the emphasis given to these programs in decentralized vs. centralized countries seems unlikely. It is also doubtful that donors have promoted an *excessive* devolution of immunization-related activities, especially given their history of promoting vertical programs and their own vertically organized structures. Thus, an interpretation based on practical tensions between centralization and decentralization—in which donor involvement reduces the benefits of decentralization because of donors agencies' own centralizing tendencies—seems more likely, as does the possible impact of donor involvement on community participation.

immunization-related financial or technical assistance, but neither of these were available for the present study.[49]

5. **Similar results are obtained for fiscal decentralization.**

Data on fiscal decentralization illustrate one aspect of the decentralization process: namely, the extent to which government expenditure takes place at the subnational level. The relationship between these data and the *autonomy* of local governments remains ambiguous, as discussed earlier and summarized in Ebel and Yilmaz (2002), and they exclude related (and important) issues such as the taxing and regulatory power of subnational authorities. For our purposes, data on subnational expenditures—and on the proportion of these expenditures allocated to health—were used to cross-check the basic findings reported above. The results for DTP3 are shown in Table 7. Similar results were obtained for the measles vaccine. The magnitude and direction of coefficients on the variables for fiscal decentralization are broadly similar to those obtained with our binary variable for decentralization. Interaction terms using these variables and measures of national income also gave broadly similar results, though the income level at which the coefficient for decentralization turned negative was higher, at around $4,400 compared with $1,400 for the regressions in Table 2.

Table 7. Alternative measures: fiscal decentralization and decentralized health expenditure vs. the dichotomous variable

	Dichotomous variable for decentralization status			Subnational expenditure, total (SNE)			Subnational expenditure, health as a share of (SNH)		
N	719			998			998		
R^2	0.5893			0.5898			0.5865		
	Coeff.	SE	Sig.	Coeff.	SE	Sig.	Coeff.	SE	Sig.
Dichotomous/SNE/SNH	12.6	4.19	***	0.88	0.21	***	0.84	0.7	
log GDP per capita	3.63	1.05	***	5.17	0.78	***	5.13	0.75	***
log total population	−1.77	0.44	***	−2.04	0.41	***	−1.72	0.35	***
log population density	3.3	0.56	***	2 81	0.44	***	2.85	0.43	***
Participation in VII	12.75	2.8	***	11.56	2.87	***	10.97	2.77	***
Democracy score	4.38	0.5	***	4.03	0.47	***	4.48	0.44	***
Institutional quality	1 49	0.19	***	1.28	0.16	***	1.31	0 16	***
Illiteracy rate	−0 43	0.04	***	−0.39	0.03	***	−0.39	0.03	***
Ethnic tension	−1.44	0.48	***	−1.14	0.35	***	−0.97	0.35	***
Democracy * log GDP	−2.82	0.3	***	−2.74	0.25	***	−2.96	0.24	***
Dichotomous/SNE/SNH * log GDP	−7.62	2.51	***	−0 11	0.03	***	−0.1	0.09	

Key * = 0 05 < $p \leq$0 10, ** = 0.01 < $p \leq$0 05, *** = $p \leq$0 01

6. **Several expected relationships are not observed.**

Several variables were found to be consistently insignificant in estimations for both low and middle-income countries. A few of these are worth mentioning specifically.

[49] Data on donor financing of immunization programs is currently being compiled by the World Health Organization for around 30 countries. This might provide a better indicator of technical assistance than measures of procurement support alone. For the present study, WHO provided data on whether or not there was a WHO staff member dedicated to immunization in each country office. Given the possible endogeneity of this measure with immunization coverage, for example if WHO staff members are selectively placed in countries with low coverage, we elected not to use this variable as a measure of donor support.

Literacy rates, while significant by themselves, did not seem to modify the effect of decentralization when included as an interaction term. Hypothetically, a literate population might be in a better position to hold local officials accountable for the services they administer, which in turn would make for a favorable interaction between decentralization and literacy rates. On the other hand, a more literate population might be equally liable to demand services *other* than immunization, especially in a decentralized setting, in which case the effect of literacy on immunization might be neutral or even negative. The non-significance of the interaction between literacy and decentralization may reflect the combined effect of these two countervailing tendencies, or alternatively the presence of no interaction effect whatsoever.

Indicators of access to communication technologies—radios, televisions, newspapers and telephones—were also not significant in most estimations. *A priori*, one might speculate a positive relationship between access to these technologies and immunization coverage rates, perhaps through channels such as improved penetration of health-related messages or a closer identification with modernity and its associated practices (Caldwell, Reddy and Caldwell 1983, Caldwell 1986, Gauri and Khaleghian 2002). One might also speculate a positive interaction with decentralization, for example by improving public access to information on local government performance (and thus improving accountability) or by providing local authorities with additional channels to disseminate and receive information about services they administer. Our results provide little support for either hypothesis. Only one measure—a variable for the extensiveness of the telephone network—was significant, and this only in low-income countries; and even in estimations where the telephones variable was positive, the interaction term for decentralization and this variable was not. Measures of televisions, radios and newspapers were all negative. [50]

Finally, a measure of income inequality was found not to be significant in any of our regressions. Since decentralization can exacerbate inequality (Prud'homme 1995, McLure 1995, Litvack, Ahmed, and Bird 1998), and since non-immunized children tend to be disproportionately from poorer households (Gwatkin and others 2000), it is possible that the observed relationships between decentralization and immunization coverage are mediated—at least in part—by the former's impact on equity. If this were the case, then adjusting for income inequality would change these relationships. No such effect was observed, and neither did the inequality variable explain differences in immunization coverage itself to any great extent. This may have been a data effect, since the number of observations was small; but even in regressions with the low and middle-income country data combined (n=149), no significant effect was observed.

[50] Using a variable for press freedom rather than the availability of communications media might have provided different results.

9. Conclusions

Decentralization is not without its benefits. While empirical support may be limited, there are numerous theoretical and common-sense reasons to expect a positive relationship between decentralization and various aspects of government performance. One thing is clear, however: decentralization, for all its benefits, is *not* a panacea. Given proper design and the right environment, decentralization can be an effective reform that meets many of its theoretical expectations. Absent these conditions, however—and many of them *are* absent in developing countries, whether low or middle income—and decentralization can easily fail. An important challenge for decentralization research will be to identify the institutional correlates of successful decentralization, following the example of Azfar, Kähkönen, and Meagher (2001) in their case studies of Uganda and the Philippines. We offer several observations in this direction, based on results from the present study.

The effects of decentralization seem to be different in low and middle-income countries. Not only do we find a different direction to the relationship between decentralization and immunization coverage in different income groups—positive in low-income countries, negative in middle-income ones—we also find evidence of different pathways for these effects in each. While firm conclusions can not be drawn from an aggregated cross-sectional study such as this, we speculate that the overall difference between low and middle-income countries reflects differences in two relationships: between central and local authorities on the one hand, and between local authorities and the communities they serve on the other. The first relationship has been well examined in the decentralization literature but is seldom given the same attention in practice. Decentralization does not imply a diminution in the role and responsibilities of central government; instead, it calls for a reorientation of the central government's role, away from one of direct supervision and toward one of environment-setting and general oversight. Yet in practice, decentralizing reforms are often accompanied by substantial curtailments in the roles, responsibilities and resources of the central government, and some services—especially those with public good aspects and inter-jurisdictional externalities such as immunization, which even the theoretical literature suggests need "protection" in decentralized settings—are harmed as a result. Tendler and Freedheim's (1994) classic article on public health services in the state of Céara, Brazil, emphasized the role of the "central in the decentralized" as a key reason for Céara's success in decentralization. We draw a similar conclusion here. This does *not* imply a need for over-centralizing immunization programs, as advocated by proponents of vertical models. Instead, it implies that central public health authorities in decentralized settings should re-orient themselves to an oversight role, and should play closer attention to incentives and sanctions for local authorities rather than holding on to a parallel cadre of dedicated immunization staff. For most immunization programs, this will require a major shift in administrative thought and practice. Feilden and Nielson's (2001) manual provides an excellent place to start, but the process will also require considerable experimentation, since experience is limited.

The second relationship, between local authorities and the communities they serve, is also an important aspect of the decentralization process. Many of the proposed benefits of decentralization are based on a closer relationship between local governments and local communities, and on the information and accountability benefits that are supposed to ensue. This is not true of all public services, however. There is considerable evidence that, when given the choice, communities prefer to focus the attention and resources of their local governments on services *other* than health, or on curative health services rather than preventive ones. Local governments are also prone to "capture" by local elites whose health service preferences are typically for curative care. This leaves preventive programs such as immunization in a bind. On the one hand, they seek to gain the benefits of decentralization and community involvement *vis-à-vis* accountability and local information. But on the other hand, they can be adversely affected by local political economy issues and by community members' preferences for other types of service. This is not an easy question to resolve. We speculate that the former pattern dominates in low-income countries, with the benefits outweighing the costs, and that the latter pattern becomes increasingly dominant as incomes rise. This suggests that policies to stimulate community involvement in low-income countries should continue to be general, i.e., to promote community engagement in a wide span of issues related to public service provision, but that efforts to stimulate community involvement in middle-income countries should be more service-specific in nature. Models such as the Bamako Initiative have been successful in low-income countries in spite of wide span of health services which they cover. In middle-income countries, however, we speculate that similar initiatives—even if specific to the health sector, and possibly even to primary care as a whole—would impair immunization programs by reflecting the community's increasing preference for curative care, pharmaceuticals and hospital-based services over prevention. We therefore propose a community engagement strategy for middle-income countries that is based on specific support for immunization, such as by supporting civil society involvement in immunization-related activities and engaging in constituency building activities that are specific to immunization. These capacities are weakly developed in most middle-income countries, so considerable experimentation will be necessary in this area also.

Several other observations are also worth mentioning in summary. First, institutional capacity does not seem to modify the relationship between decentralization and immunization coverage. This is something of a surprise. The literature on decentralization emphasizes the importance of institutional capacity at all levels. In our study, however, apart from its independent effect on immunization coverage (which is large), there is no evidence that institutional capacity makes decentralization any more or less effective. This runs contrary to prior expectations and raises the possibility that design issues—such as those concerned with central-local relationships and patterns of community participation—play a larger role than institutional capacity *per sé*. This remains speculative, however. Second, donors seem to be less effective in decentralized settings, as evidenced by their negative impact on immunization coverage in

decentralized countries and their *positive* impact (as would be expected) in centralized ones. The preference of donor agencies for vertical and centralized projects has been well-documented, especially when it comes to immunization, and may explain this effect to some extent. Also relevant is the additional complexity of donor operations in decentralized contexts, some of which is due to reluctance on the part of central governments to permit direct relationships between donors and sub-national governments and some of which arises because of donors' historical tendency to deal with central governments alone (Khaleghian 2002). Whatever the reasons, our findings highlight the need for donors to improve the quality of their engagement in decentralized settings. Third, we confirm theoretical expectations regarding the positive effect of decentralization in conditions of ethnic or linguistic heterogeneity, at least in middle-income countries.

Much work remains to better understand the impact of decentralization on government performance and public service delivery. Recent case studies have begun the difficult but important task of collecting micro-level information on the determinants of good and bad performance in decentralization, and macro-level studies (of which there are still very few) have begun to make a contribution as well. While many methodological questions remain—central among them the key political economy question of *why* some countries choose to decentralize in the first place—an emerging conclusion from all these studies is that not all public services are alike in their response to decentralizing reforms. While some services respond well, others respond poorly. A fruitful area of future research may be to differentiate services according to their response, and to formulate policy guidelines to protect those that do poorly under conditions of decentralized governance. Immunization, especially among middle-income countries, falls into the latter category, and should be safeguarded from these adverse effects.

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